

## CLAIMS

What is claimed is:

- 1           1. An apparatus for generating a digital output signal representing  
2   a captured image, said apparatus comprising:  
3           a sensor for capturing said image and generating a sensor output  
4   signal;  
5           a gain control amplifier coupled to receive said sensor output  
6   signal, said gain control amplifier having controls for applying various  
7   levels of gain to said sensor output signal;  
8           an analog-to-digital converter coupled to said gain control  
9   amplifier, said analog-to-digital converter generating said digital output  
10   signal representing said captured image; and  
11           a processor coupled to said analog-to-digital converter and said gain  
12   control amplifier, said processor providing a control signal to said gain  
13   control amplifier for adjusting the level of gain applied by said gain control  
14   amplifier.
- 1           2. The apparatus of claim 1 wherein said gain control amplifier  
2   applies different levels of gain to different regions of said captured image.
- 1           3. The apparatus of claim 1 wherein said processor generates a gain  
2   map containing gain settings applied to said sensor output signal by said  
3   gain control amplifier.

1        4. The apparatus of claim 3 wherein said gain map is continually  
2 updated by said processor to include changes in said captured image.

1        5. The apparatus of claim 3 wherein said gain map is a two  
2 dimensional array of gain settings, each gain setting indicating a particular  
3 gain to be applied by said gain control amplifier to a corresponding region  
4 of said captured image.

1        6. The apparatus of claim 3 further including a register coupled to  
2 said processor and said gain control amplifier.

1        7. The apparatus of claim 6 wherein said gain map is stored in said  
2 register and said gain control amplifier reads said gain settings from said  
3 register.

1        8. The apparatus of claim 1 wherein said processor provides said  
2 control signal to said gain control amplifier in real-time.

1        9. The apparatus of claim 1 wherein said processor receives said  
2 digital output signal from said analog-to-digital converter and analyzes  
3 said output signal to determine whether a sufficient level of detail is  
4 provided in the captured image.

1        10. The apparatus of claim 9 wherein said gain level is increased in  
2 dark portions of the captured image and said gain level is decreased in  
3 bright portions of the captured image.

1 11. The apparatus of claim 1 further including a video processing  
2 circuit coupled to said analog-to-digital converter and a digital-to-analog  
3 converter coupled to said video processing circuit, wherein said digital-to-  
4 analog converter generates an analog signal representing the captured  
5 image.

1 12. An apparatus for capturing an image and generating a digital  
2 signal representing said captured image, comprising  
3 a camera, including:

4 a sensor for capturing said image and generating a sensor  
5 output signal;

6 a gain control amplifier coupled to receive said sensor  
7 output signal, said gain control amplifier having controls for applying  
8 various levels of gain to said sensor output signal;

9 an analog-to-digital converter coupled to said gain control  
10 amplifier, said analog-to-digital converter generating said digital signal  
11 representing said captured image; and

12 a processor coupled to said camera, said processor receiving said  
13 digital signal generated by said analog-to-digital converter, and wherein  
14 said processor provides a control signal to said gain control amplifier for  
15 adjusting the level of gain applied by said gain control amplifier.

1 13. The apparatus of claim 12 wherein said processor generates a  
2 gain map containing gain settings applied to said sensor output signal by  
3 said gain control amplifier.

1           14. The apparatus of claim 13 wherein said gain map is a two  
2 dimensional array of gain settings, each gain setting indicating a particular  
3 gain to be applied by said gain control amplifier to a region of said captured  
4 image.

1           15. The apparatus of claim 14 wherein said processor divides said  
2 captured image into a two dimensional array of image regions, each image  
3 region associated with a corresponding gain setting in said gain map.

1           16. The apparatus of claim 13 wherein said camera further includes  
2 a register coupled to said processor and said gain control amplifier.

1           17. The apparatus of claim 16 wherein said gain map is stored in  
2 said register and said gain control amplifier reads said gain settings from  
3 said register.

1           18. A camera for producing a digital output signal representing a  
2 captured image, said camera comprising:  
3           a sensor for capturing said image and generating a sensor output  
4 signal;  
5           a gain control amplifier coupled to receive said sensor output  
6 signal, said gain control amplifier having controls for applying various  
7 levels of gain to said sensor output signal;  
8           an analog-to-digital converter coupled to said gain control  
9 amplifier, said analog-to-digital converter generating said digital output  
10 signal representing said captured image; and

11 a register coupled to said gain control amplifier, wherein a gain map  
12 is stored in said register for determining appropriate levels of gain to apply  
13 to said sensor output signal.

1 19. The camera of claim 18 further including a processor coupled to  
2 said analog-to-digital converter and said register, wherein said processor  
3 receives said digital output signal and provides an updated gain map to  
4 said register.

1 20. The camera of claim 18 wherein said gain map is a two  
2 dimensional array of gain settings, each gain setting indicating a particular  
3 gain to be applied by said gain control amplifier to a corresponding region  
4 of said captured image.

1 21. A method for enhancing the dynamic range of an image  
2 generated by a camera having a digital output signal, said method  
3 comprising the steps of:  
4 capturing an image;  
5 generating a signal representative of said captured image;  
6 amplifying said signal in response to gain settings contained in a  
7 gain map, each gain setting associated with a particular region of said  
8 captured image; and  
9 updating said gain settings contained in said gain map in response to  
10 clipping of said amplified signal.

1        22. The method of claim 21 wherein said gain settings are increased  
2        in dark portions of the image and said gain settings are reduced in bright  
3        portions of the image.

1        23. The method of claim 21 wherein the step of updating said gain  
2        settings includes dividing said captured image into a plurality of image  
3        regions, wherein each image region is associated with a particular gain  
4        setting in said gain map.

1        24. The method of claim 23 further including the step of analyzing  
2        each image region and updating said associated gain setting in response to  
3        clipping of said amplified signal in said image region.

1        25. An apparatus for capturing an image and generating a digital  
2        output signal representing said captured image, said apparatus  
3        comprising:  
4        means for capturing said image and generating an analog signal  
5        representing said captured image; -  
6        means for updating a plurality of gain settings applied to said  
7        analog signal representing said captured image; and  
8        means for generating a control signal indicating a particular gain  
9        setting to be applied to a portion of said analog signal representing said  
10       captured image.

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